INTRODUCTION

The economic safety net for farmers is being altered as the United States reduces subsidies for farm products. Increased research will help to stabilize production in an increasingly variable environment. Innovation is an outcome of research and is essential for U.S. agriculture to remain globally competitive. The National Research Initiative Competitive Grants Program (NRI) is a mechanism to encourage the development of solutions to current and future problems facing U.S. agriculture in providing a safe and secure food and fiber supply. American agriculture has gone through many transitions over the years in changing from a resource-based to a science-based enterprise. Agricultural science today includes the sophisticated application of new biological tools and information drawn from the entire biological realm. The ability to manipulate plants and animals and important associated microbes is impressive and yet rapidly increasing on a daily basis. The application of new biological approaches is having a major impact on how agribusiness approaches the development of new products.

The protection of our food, fiber, and feedstock supply is a constant race against ever-changing pathogen populations, environmental stresses, and the world economic situation. An investment in research reduces the vulnerability of U.S. agriculture to such stresses. Scientific knowledge about agricultural plants and animals not only leads to breakthroughs for improving the effectiveness of American agriculture, but it also can prevent possible crises or allow a more rapid response when unanticipated threats do occur.

The projects abstracted in this book are testimony to the impressive, in-depth science being applied to agriculture. They represent the search for and application of new knowledge - from the cell to the organism to the agricultural system level. This research reflects numerous means to increase the safety and quality of U.S. agricultural outputs - while producing it in a manner that does not harm the environment. Some projects consider the impacts on water quality and soil fertility. Others take a holistic approach testing agricultural systems that integrate many aspects of managing today's agriculture. Ways to achieve rural development and economic success are the subjects of other projects.

The NRI, which is administered through the Cooperative State Research, Education, and Extension Service (CSREES), is the largest competitive grants program in the United States Department of Agriculture (USDA) research and development portfolio, representing about 6% of the Department’s R&D budget. The purpose of the NRI is to increase the amount and quality of science applied to solving the problems facing U.S. agriculture and forestry:

- by attracting the participation of the best U.S. scientists in research needed to assure a sustainable agricultural and forestry system,
- through science and program management provided primarily by the scientific community,
- through scientific breakthroughs that open fundamentally new approaches to solve problems facing agriculture and forestry,
- by funding the best possible agricultural research as selected through the use of competitive merit review as evaluated by scientific peers.

The NRI supports both "fundamental" and "mission-linked" research which contribute to the knowledge base needed for helping agriculture become sustainable. Fundamental research tests

new ideas and seeks scientific understanding of agriculturally important organisms, ecosystems, and processes, as examples. Mission-linked research provides scientific understanding needed specifically to solve current problems important to food, agriculture, or the environment. As examples of fundamental research, the NRI has programs in support of research on photosynthesis, nitrogen-fixation, genetic mechanisms, human nutrition, and plant and animal growth and development. The NRI programs on biologically based pest management, agricultural systems, mapping plant and animal genomes, adding value to agricultural products, and developing new markets for agricultural products are examples of mission-linked research.

One of the strengths of the NRI is that it draws from the wealth and breadth of all qualified scientists in the United States, whether from a State agricultural experiment station, a college, a university, a Federal agency, a private organization, a corporation, any other research institution or organization, or even from an individual. Proposals are competitively reviewed by peers around the world as well as an assembled panel of experts in the field. Scientific merit of the proposal, qualifications of proposed project personnel and adequacy of facilities, and relevance of the project to long-range improvements in and sustainability of U.S. agriculture are the criteria for evaluation. Special care is taken to avoid conflicts of interest in the review process.

The NRI makes *Agricultural Research Enhancement Awards* (AREA) to assist institutions in developing or strengthening the competitiveness of their research programs and in attracting new scientists to careers of national needs in the food, agricultural, and environmental sciences. AREA awards include postdoctoral fellowships, new investigator awards, and strengthening awards. Strengthening Awards are limited to small and mid-sized academic institutions or institutions in the USDA-EPSCoR states. Four types of Strengthening Awards are available: 1) Research Career Enhancement Awards that support sabbatical leaves; 2) Equipment Grants for the purchase of equipment; 3) Seed Grants to enable investigators to collect preliminary data in preparation for applying for a standard research grant; and 4) Strengthening Standard Research Project Awards that fund research grants at eligible institutions. The projects and individuals supported by AREA are included in this report. The NRI reserves about 10% of its available funds for AREA awards, which is the largest percentage and second only to NSF in total funds of any federal grants program devoted to strengthening the research enterprise.

In 1997, 2840 proposals were received and 712 were awarded - a success rate of 24%. Of the $87,315,733 awarded, 52.1% supported fundamental research and 47.9% supported mission-linked research. The average size grant was $141,834 (excluding Research Career Enhancement Awards, Equipment grants, Seed Grants, conferences, and continuations) for 2.6 years. The exchange of ideas on timely topics is fostered through the support of numerous conferences. In 1997, 29 conferences were partially funded in the various research areas at an average of $6569 (a correction of the figures listed for conferences in the FY 1997 NRI Annual Report).

The NRI participated in three interagency programs: Collaborative Research in Plant Biology (NSF, DOE, USDA), Terrestrial Ecology and Global Change (NSF, DOE, USDA, NASA), and the *Arabidopsis* Genome Sequencing Project (NSF, DOE, USDA). The funding equivalent of 1 or 2 grants is provided to each of these programs.

This report provides brief descriptions, provided by the investigators, of the 712 new research grants funded by the NRI in fiscal year 1997. This fundamental and mission-linked research seeks to address problems critical to the future of agriculture. Many of these projects will be

carried out by one or two investigators representing a single discipline. Others will be carried out by teams of investigators representing several disciplines.

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The current NRI Program Description and NRI Application Kit, as well as the Abstracts of Funded Projects and the NRI Annual Report for this and previous years, are available on the NRI Home Page at www.reeusda.gov/nri.